

Study Guide

For use with pages 177–181

GOAL Find the GCF of two or more whole numbers.**VOCABULARY**

A **common factor** is a whole number that is a factor of two or more nonzero whole numbers. The greatest of the common factors is the **greatest common factor (GCF)**.

Two or more numbers are **relatively prime** if their greatest common factor is 1.

EXAMPLE 1 Finding the Greatest Common Factor

A florist is making identical flower arrangements. There are 75 tulips, 60 irises, 30 hollyhocks, and 45 dahlias. What is the greatest number of arrangements that can be made? How many tulips, irises, hollyhocks, and dahlias will be in each arrangement?

Method 1: List the factors of each number. Identify the greatest number that is on every list.

Factors of 75: 1, 3, 5, (15), 25, 75

Factors of 60: 1, 2, 3, 4, 5, 6, 10, 12, (15), 20, 30, 60

Factors of 30: 1, 2, 3, 5, 6, 10, (15), 30

Factors of 45: 1, 3, 5, 9, (15), 45

The common factors are 1, 3, 5, and 15.
The greatest common factor is 15.

Method 2: Write the prime factorization of each number. The GCF is the product of the common prime factors.

$$75 = 3 \cdot 5 \cdot 5$$

$$60 = 2 \cdot 2 \cdot 3 \cdot 5$$

$$30 = 2 \cdot 3 \cdot 5$$

$$45 = 3 \cdot 3 \cdot 5$$

The common prime factors are 3 and 5.
The GCF is the product $3 \cdot 5 = 15$.

Answer: The greatest number of flower arrangements that can be made is 15. Each arrangement will have $75 \div 15 = 5$ tulips, $60 \div 15 = 4$ irises, $30 \div 15 = 2$ hollyhocks, and $45 \div 15 = 3$ dahlias.

Exercises for Example 1

Find the greatest common factor of the numbers.

1. 27, 81

2. 36, 48

3. 21, 49, 56

4. 45, 75, 90

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EXAMPLE 2 Identifying Relatively Prime Numbers

Find the greatest common factor of the numbers. Then tell whether the numbers are relatively prime.

- a. 19, 57 b. 16, 81

Solution

- a. List the factors of each number. Identify the greatest number that the lists have in common.

Factors of 19: 1, 19

Factors of 57: 1, 3, 19, 57

The GCF is 19. So, the numbers are not relatively prime.

- b. Write the prime factorization of each number.

$$16 = 2^4 \qquad 81 = 3^4$$

There are no common prime factors. However, two numbers always have 1 as a common factor. So, the GCF is 1, and the numbers are relatively prime.

Exercises for Example 2

Find the greatest common factor of the numbers. Then tell whether the numbers are relatively prime.

5. 15, 99 6. 17, 85 7. 14, 27 8. 96, 204

EXAMPLE 3 Finding the GCF of Monomials

Find the greatest common factor of $121x^2y^4$ and $33x^3y^2$.

Factor the monomials. The GCF is the product of the common factors.

$$\begin{aligned} 121x^2y^4 &= 11 \cdot 11 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \\ 33x^3y^2 &= 3 \cdot 11 \cdot x \cdot x \cdot x \cdot y \cdot y \end{aligned}$$

Answer: The GCF is $11x^2y^2$.

Exercises for Example 3

Find the greatest common factor of the monomials.

9. $300ab^2$, $125a^2b$ 10. $12xy$, $18x$
11. $75y^5z^3$, $45y^4$ 12. $159x^5y^5$, $126xy$